

LESSON PLAN

Walking on the Moon

[Craters of the Moon National Monument & Preserve](#)



walking on the moon
Enrique Becali

GRADE LEVEL:

Third Grade-Eighth Grade

SUBJECT:

Mathematics, Science and Technology

DURATION:

1/2 hour for each section

GROUP SIZE:

Up to 24

SETTING:

indoors or outdoors

NATIONAL/STATE STANDARDS:

NGSS.SEP.1-8

OVERVIEW

These activities include simple timing and math which will allow students to compare their walking velocity at school to their pace at Craters of the Moon and on the lunar surface.

(CLASSROOM & FIELD TRIP ACTIVITIES)

OBJECTIVE(S)

Students will be able to calculate and compare their velocity on smooth surfaces versus rough surfaces in order to infer the effect of different conditions (roughness of surface, slope, surface gravity) on their speed.

BACKGROUND

Instructor must review the use of stopwatches prior to the beginning of the activities. Students should also be instructed to walk at a normal pace (no skipping, running, walking fast etc.). Once on the trail distribute the parent/escorts through the group to guide the students (prevent the students from going the wrong way, going off the trail, running or stopping) and to help prevent errors in timing.

At the school student answers/times should be around 20 minutes per mile. Field trip velocities should be more than 20 but not over 40 minutes per mile.

Lesson plan developed by Teacher-Ranger Enrique Becali in 2013.

MATERIALS

Timers

Calculators

PROCEDURE

Part I: Calculate your walking pace at school (pre-visit activity)

1. Instructor and/or students measure 100 feet with a tape measure and mark “start” and “finish” with tape or chalk in the school yard, gym, track, or parking lot.
2. Working in pairs, have the first member of your group walk 100 feet at a normal pace while the second student does the timing with a stopwatch. Then switch and have the first student measure the second. Please remind students that they should walk at a normal pace (no racing!).

Time in seconds	Multiplied by 53	Divided by 60	Time (minutes) it takes to walk 1 mile

Part 2: Calculate your walking pace at Craters of the Moon (field trip activity)

- Prior to your visit, choose a $\frac{1}{2}$ mile trail, or trail section, that your students will hike. The following chart shows some good options for $\frac{1}{2}$ mile distances:

Trail Name	Start	Finish
Inferno Cone	Trailhead sign	Large tree at top of cone
Broken Top Loop	Big Sink Overlook trail intersection	Sign #7
Caves Trail	Trailhead sign	Indian Tunnel cave entrance

- Working in pairs, have both members walk the trail and calculate their time using a stopwatch and the following table:

Time in seconds	(Multiply by 2)	Time (minutes) it takes to walk 1 mile (Divide by 60)

Part 3: Calculate your walking pace on the moon (post-visit activity)

Due to its smaller size, the moon's gravitational pull is considerably less than on earth. For example, you weigh only $\frac{1}{6}$ of your earth weight on the lunar surface. There are many factors involved but according to one researcher normal walking speed would be .4 times your speed on earth (from Bannoura). However, other modes of travel like bounding or skipping could propel an astronaut considerably faster than on earth!

- Use the chart below to determine your weight and walking pace on the lunar surface.

Weight on earth (lbs.)	Weight on the moon	Time (minutes) it takes to walk 1 mile at Craters	Time (minutes) it would take to walk 1 mile on the
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	(divide your weight by 6)	(from Part 2)	moon (multiply your Craters velocity by .4)

ASSESSMENT

Completeness of work and student effort are the primary assessment criteria for this lesson plan.

PARK CONNECTIONS

These activities complement a field trip to Craters of the Moon by adding science, technology, engineering, and math (STEM) elements to your visit.

EXTENSIONS

1. Convert or utilize the metric system to measure your velocity.
2. Return to Craters in the winter time and calculate and compare your pace while snowshoeing.
3. Calculate an approximate pace for an Oregon Trail migrant and compare to student speeds. (Overall distance travelled by Oregon Trail migrants was 2170 miles in about 5 months of travel time).
4. Ask students if a hammer or a feather will fall faster to the ground...
 - a. On earth?
 - b. On the moon?

Watch the following demonstration: http://www.youtube.com/watch?v=5C5_dOEyAfk and explore the reasons why with your students.

VOCABULARY

velocity, pace